U. S. FOREST SERVICE

RESEARCH NOTE NC-63

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

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ACORN MOISTURE CONTENT CRITICAL FOR CHERRYBARK OAK GERMINATION

ABSTRACT.—Cherry bark oak acorns exposed to air lose moisture rapidly resulting in delayed or complete lack of germination.

Cherrybark oak (*Quercus falcata* var. *pagodaefolia* Ell.) grows fast on the bottomlands of the mid-Mississippi Valley, has good form, and prunes itself well. But it occurs in that area only as an occasional tree. Whether this low population is due to inadequate germination, unfavorable seedbed, or other identifiable causes is not known. However, a preliminary survey showed that site is apparently not a limiting factor in southern Illinois. We suspected that low germination might restrict the tree's occurrence in this region, which is the northern limit of its range. A study showed that cherrybark oak acorns exposed to air lose moisture rapidly resulting in delayed or complete lack of germination. This could explain the infrequent occurrence of cherrybark oak in southern Illinois, where dry falls are common, and suggests that nurserymen take precautions to prevent acorn drying.

The Study

Acorns were collected from several cherryb oaks in early October. The acorns were loose in th cups, but had not begun to fall. They were put in plastic bags and placed in cold storage the same day.

The following March, 80 acorns were removed from cold storage, weighed, placed in paper trays, and exposed to the air at room temperature. This procedure was repeated every 2 days until the first group had been exposed for 20 days, thus making 11 groups for a total of 880 acorns. At this point the acorns were reweighed and half of each group was planted an inch deep in vermiculite-filled flats in a greenhouse. The flats were kept moist, and were checked each day until germination ceased.

The remaining half of each group was placed in a drying oven at 110°C. until weight stabilized. The ovendry weights were used to determine the moisture content after storage and again after exposure. The moisture content was 40.5 percent when the acorns were removed from storage, and 6.3 percent after 20 days of air drying.

Results

Acorns air-dried for more than 4 days did not germinate. We found that two-thirds of the acorn moisture was lost during this initial 4-day period, and virtually all of the moisture loss occurred in the first 6 days (fig. 1). This emphasizes that moisture content is critical for cherrybark oak germination and that acorns will dry rapidly without favorable moisture conditions.

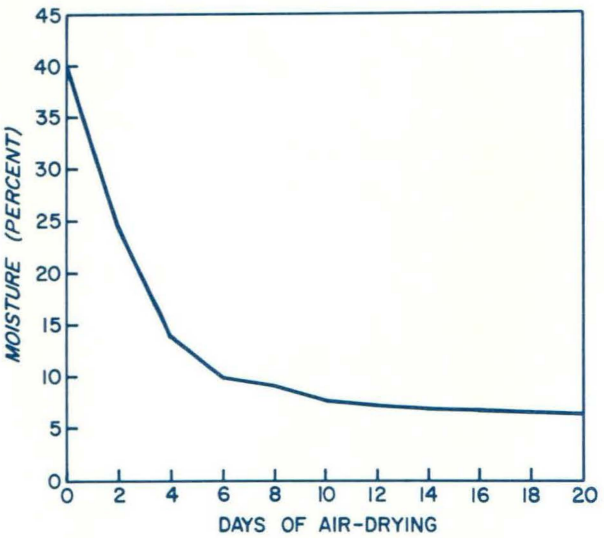

Figure 1. — Moisture percent (based on ovendry weight) as related to number of days of air-drying.

The first seedling emerged 15 days after sowing in the group with no exposure. In the group air-dried for 2 days, a seedling emerged on the 17th day. However, it took 24 days for a seedling to germinate from the group air-dried for 4 days (fig. 2). Although the acorns exposed for 2 days eventually produced as many seedlings as the ones that were not exposed, the seedlings developed more slowly (fig. 3).

These results show that stratified cherrybark oak acorns can lose moisture rapidly and that this loss is accompanied by delayed germination and reduced germinative capacity. At this stage of the investigation, we do not know whether fresh acorns and stratified acorns behave similarly; if rapid drying and embryo destruction occur in fresh acorns as well as stratified ones, the dry falls common to southern Illinois may explain the infrequent occurrence of cherrybark oak there.

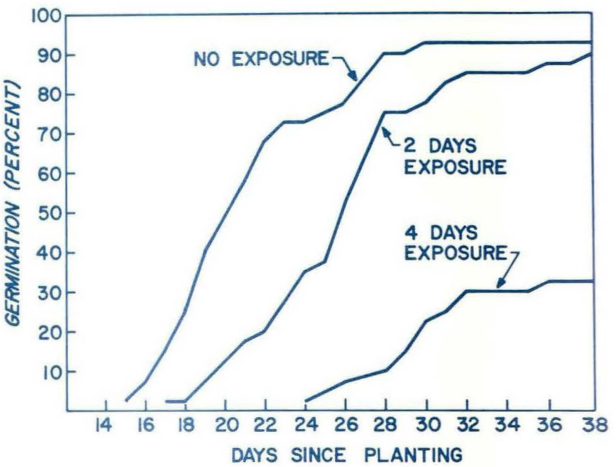

Figure 2. — Effect of period of exposure to air at room temperature on germination.

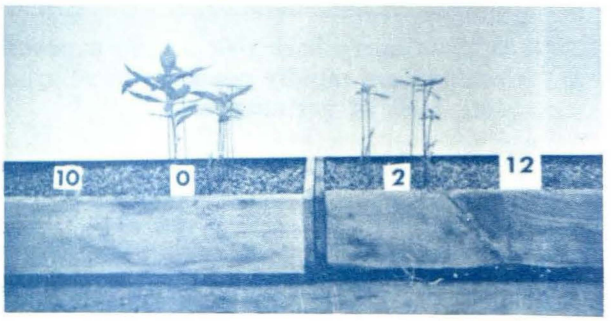

Figure 3. — Difference in development of cherrybark oak seedlings 30 days after sowing. Right: acorns exposed 2 days. Left: acorns sown directly from storage. (F-518331)

The results show that, for nursery production, care should be taken to collect cherrybark oak acorns immediately after seedfall, or even to collect the acorns directly from the trees. The acorns should be sown immediately in the fall, or promptly placed in moist cold storage for spring sowing.

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